

# Kinetic & Potential Energy



## PART 1: CONCEPTS

1. Describe the relationship between motion and energy.

As  $KE \uparrow$ , motion  $\uparrow$  and visa versa

2. What kind of energy is represented by an archer stretching a bow string?

Increasing potential Energy.

3. How are kinetic and potential energy different?

Movement/motion      stored Energy.



4. Can an object have both kinetic and potential energy at the same time? Explain.

yes.

Ans will vary

5. How does the potential energy of an object change when its height is tripled?

It will triple (3x)

6. How does the kinetic energy of an object change when its velocity is tripled?

It will be 9x

$$KE = \frac{1}{2}mv^2 \quad (3)^2 = 9$$

## PART 2: CALCULATIONS Be sure to write out the formula in symbols and include units in your work!

7. A 60 kg person walks from the ground to the roof of a 74.8 m tall building. How much gravitational potential energy does she have at the top of the building?

<p>GIVEN:</p> <p><math>m = 60 \text{ kg}</math></p> <p><math>g = 10 \text{ m/s}^2</math></p> <p><math>h = 74.8 \text{ m}</math></p> <p>FORMULA:</p> <p><math>PE = mgh</math></p>	<p>WORK:</p> <p><math>PE = mgh</math></p> <p><math>= 60 \cdot 10 \cdot 74.8</math></p> <p><math>= 44,880 \text{ J}</math></p>
	<p>ANSWER: <math>44,880 \text{ J}</math></p>

8. A pitcher throws a 0.145 kg baseball at a velocity of 30 m/s. How much kinetic energy does the ball have?

<p>GIVEN:</p> $m = .145 \text{ kg}$ $V = 30 \text{ m/s}$ <p>FORMULA:</p> $KE = \frac{1}{2}mv^2$	<p>WORK:</p> $KE = \frac{1}{2}mv^2$ $KE = \frac{1}{2}(.145)(30^2)$ $= 65.25$ <p>ANSWER: 65.25 J</p>
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9. The kinetic energy of a bowling ball traveling at a speed of 4 m/s is 50 joules. Find the mass of the ball.

<p>GIVEN:</p> $m = ?$ $V = 4 \text{ m/s}$ $KE = 50 \text{ J}$ <p>FORMULA:</p> $KE = \frac{1}{2}mv^2$	<p>WORK:</p> $KE = \frac{1}{2}mv^2$ $\frac{2KE}{v^2} = m$ $\frac{2(50)}{4^2} = m$ $\rightarrow 6.25$ <p>ANSWER: 6.25 kg</p>
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10. The gravitational potential energy of a 15 kg object is 294 joules. What is the height of the object above the ground?

<p>GIVEN:</p> $PE = 294 \text{ J}$ $m = 15 \text{ kg}$ $g = 10 \text{ m/s}^2$ $h = ?$ <p>FORMULA:</p> $PE = mgh$	<p>WORK:</p> $PE = mgh$ $\frac{PE}{mg} = h$ $\frac{294}{(15)(10)} = h$ $\rightarrow h = 1.96 \text{ m}$ <p>ANSWER: 1.96 m</p>
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11. What is the speed of a 48 kg dog running across a lawn with 216 joules of kinetic energy?

<p>GIVEN:</p> $KE = 216 \text{ J}$ $m = 48 \text{ kg}$ $V = ?$ <p>FORMULA:</p> $KE = \frac{1}{2}mv^2$	<p>WORK:</p> $KE = \frac{1}{2}mv^2$ $\sqrt{\frac{2KE}{m}} = v$ $\sqrt{\frac{2(216)}{48}} = 3 \text{ m/s}$ <p>ANSWER: 3 m/s</p>
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